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ABSTRACT

This guide to Indiana's academic standards in Language Arts, Mathematics, Science, and the Social Studies for Grade 4 students begins with a note to students and another note to parents. The guide spells out what student should know and be able to do in each subject, at each grade level. The guide also lists 10 things parents can do to help students succeed and includes information on assessments or measures of student learning. The guide cites the following seven standards for English/Language Arts: (1) Reading: Word Recognition, Fluency, and Vocabulary Development; (2) Reading: Comprehension; (3) Reading: Literary Response and Analysis; (4) Writing: Process; (5) Writing: Applications (Different Types of Writing and Their Characteristics); (6) Writing: English Language Conventions; and (7) Listening and Speaking: Skills, Strategies, and Applications. It lists these seven standards for Mathematics: Number Sense, Computation, Algebra and Functions, Geometry, Measurement, Data Analysis and Probability, and Problem Solving. The guide enumerates the following six standards for Science: Nature of Science and Technology, Scientific Thinking, Physical Setting, Living Environment, Mathematical World, and Common Themes. It lists these five standards for the Social Studies: History; Civics and Government; Geography; Economics; and Individuals, Society, and Culture. Attached are sheets for notes. (NKA)

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ED 477 623

Grade 4

Indiana's Academic Standards

English/Language Arts
Mathematics
Science
Social Studies

Adopted by the
Indiana State
Board of Education
2000 – 2001

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CS 512 260

BEST COPY AVAILABLE

Dear Student,

The world is changing fast. In order for you to succeed in school, at work, and in the community, you will need more skills and knowledge than ever before.

Getting in shape academically is the single most important thing you can do to prepare for a successful future.

This booklet of Academic Standards clearly spells out what you should know and be able to do in each subject, at your grade level. Examples are given to help you understand what is required to meet the Standards. **Please review this guide with your teachers and share it with your parents and family.**

Whether you go on to be a surgeon, computer technician, teacher, or airplane mechanic, learning never stops. There will always be a more demanding computer application, a new invention, or a more complex project awaiting you.

To be ready for tomorrow — get in top academic shape today. Use this guide year round to check your progress.

Dear Parent,

The demand is greater than ever for people who can read, write, speak effectively, analyze problems and set priorities, learn new things quickly, take initiative, and work in teams. Technology has already transported us into a time where the next e-commerce opportunity is limited only by our imagination.

That's why Indiana has established new Academic Standards in English/language arts, mathematics, science, and social studies. These world-class Standards outline what your student should know and be able to do in each subject, at each grade level.

Indiana's new Academic Standards were recommended by Indiana's Education Roundtable and adopted by the State Board of Education. According to Achieve, Inc. and other respected education experts, these Standards are among the best in the nation.

Higher academic standards pose a challenge, but Indiana students have shown that they can measure up. Our students know that higher expectations lead to greater rewards — and they're prepared to work harder. We know that by setting specific goals, everyone wins. Teachers have clear targets, students know what's expected, and you have detailed information about your child's strengths and weaknesses.

How can you be sure that your student will be ready to meet these challenges? First, keep in mind that learning does not take place only in the classroom. Students spend far more time at home than they do in school. How they spend their time can make a real difference. That is where your help is the most important.

On the next page is a list of 10 things you can do to help your student get a good education. **Nothing will have a bigger impact on your student's success than your involvement in his or her education.** We hope you use this guide as a tool to help your child succeed today and in the future.

Sincerely,

Frank O'Bannon

Governor Frank O'Bannon

Dr. Suellen Reed

Dr. Suellen Reed,
Superintendent of Public Instruction

Stan Jones

Stan Jones,
Commissioner for Higher Education

10 things parents can do to help students succeed

1. **Build relationships with your child's teachers.** Find out what each teacher expects of your child and how you can help your child prepare to meet those expectations.

2. **Read.** Reading is the foundation for all learning. Read to your young child, encourage your older child to read to you, or spend time together as a family reading. All this helps your child develop strong reading habits and skills from the beginning and reinforces these habits and skills as your child grows. Reading is one of the most important contributions you can make to your child's education.

3. **Practice writing at home.** Letters, journal entries, e-mail messages, and grocery lists are all writing opportunities. Show that writing is an effective form of communication and that you write for a variety of purposes.

4. **Make math part of everyday life.** Cooking, gardening, paying bills, and even shopping are all good ways to help your child understand and use mathematics skills. Show that there may be many ways to get to the right answer and encourage your child to explain his or her method.

5. **Ask your child to explain his or her thinking.** Ask lots of "why" questions. Children should be able to explain their reasoning, how they came up with the right answer, and why they chose one answer over another.

6. **Expect that homework will be done.** Keep track of your child's homework assignments and regularly look at his or her completed work. Some teachers now give parents a number to call for a recorded message of that day's homework assignments; others put the information on the Internet. If your school doesn't offer these features, talk to the teacher about how you can get this important information. Even if there aren't specific assignments, find out how you can stay informed about what your child is working on so that you can help at home.

7. **Use the community as a classroom.** Feed your child's curiosity about the world 365 days a year. Use the library to learn more about the history of your town. A visit to a farmer's market can help your child picture our state's rich agricultural tradition. Take your young child to zoos and parks and your older child to museums and workplaces to show how learning connects to the real world.

8. **Encourage group study.** Open your home to your child's friends for informal study sessions. Promote outside formal study groups through church or school organizations or other groups. Study groups will be especially important as your child becomes older and more independent. The study habits your child learns now will carry over into college and beyond.

9. **Help other parents understand academic expectations.** Use your school and employee newsletters, athletic associations, booster clubs, a PTA or PTO meeting, or just a casual conversation to help other parents understand what academic standards mean for them, their children, and their school and how they can help their children learn at home.

10. **Spend time at school.** The best way to know what goes on in your child's school is to spend time there. If you're a working parent, this isn't easy, and you may not be able to do it very often. But "once in awhile" is better than "never."

Remember: *You are the most important influence on your child. Indiana's Academic Standards give you an important tool to ensure that your child gets the best education possible.*

Measuring Student Learning

Children develop at different rates. Some take longer and need more help to learn certain skills. Assessments, like ISTEP+, help teachers understand how students are progressing and assist in identifying academic areas where students may need additional attention.

Assessments also provide a measure of school accountability – assisting schools in their efforts to align curriculum and instruction with the state's Academic Standards and reporting progress to parents and the public. Students in designated grades take ISTEP+ in the fall of each school year – with the assessment based on what the child should have learned and retained from the previous year.

Core 40 End-of-Course Assessments are given at the end of specific high school classes and are a cumulative assessment of what students should have learned during that course. End-of-Course Assessments also provide a means to ensure the quality and rigor of high school courses across the state. Voluntary for schools at this time, a selection of these assessments will be phased in over the next five years.

◗ Indicates mandatory ISTEP+ testing ♦ Indicates voluntary assessments

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4
	♦Reading	♦Reading	◗ English/Lang. Arts ◗ Mathematics	

What's the Goal? By Grade 4, have students moved beyond learning to read toward "reading to learn" other subjects? Can each student write a short, organized essay? Can each student use math skills to solve everyday, real-world problems?

Grade 5	Grade 6	Grade 7	Grade 8
◗ Science (begins 2003) ◗ Social Studies (begins 2004)	◗ English/Lang. Arts ◗ Mathematics	◗ Science (begins 2005) ◗ Social Studies (begins 2006)	◗ English/Lang. Arts ◗ Mathematics

What's the Goal? By Grades 7 and 8, have students developed strong enough study habits in English and math skills to be ready for high school?

Grade 9	Grade 10 (GQE)	Grade 11	Grade 12	Graduation
◗ Science (begins 2007) ◗ Social Studies (begins 2008)	◗ English/Lang. Arts ◗ Mathematics	(two re-tests available for those who have not passed the GQE)	(two re-tests available for those who have not passed the GQE)	(or continued extra help)
♦Core 40 End-of-Course Assessments	♦Core 40 End-of-Course Assessments	♦Core 40 End-of-Course Assessments	♦Core 40 End-of-Course Assessments	

What's the Goal?
By Grade 12, can students read well enough to pass a driver's exam, understand an appliance manual, or compare two opposing newspaper editorials? Could students write an effective job application letter? By testing skills like these in Grade 10, teachers know whether – and in which skill area – students need more attention before it's time to graduate.

For more information visit www.doe.state.in.us/standards and click on Assessment or call 1-800-54-ISTEP (1-888-544-7837).

Grade 4

English/Language Arts

Standard 1

READING: Word Recognition, Fluency, and Vocabulary Development

Students understand the basic features of words. They see letter patterns and know how to translate them into spoken language by using phonics (an understanding of the different letters that make different sounds), syllables, word parts (un-, re-, -est, -ful), and context clues (the meaning of the text around a word). They apply this knowledge to achieve fluent (smooth and clear) oral and silent reading.

Decoding and Word Recognition

4.1.1 Read aloud grade-level-appropriate narrative text (stories) and expository text (information) with fluency and accuracy and with appropriate timing, changes in voice, and expression.

Vocabulary and Concept Development

4.1.2 Apply knowledge of synonyms (words with the same meaning), antonyms (words with opposite meanings), homographs (words that are spelled the same but have different meanings), and idioms (expressions that cannot be understood just by knowing the meanings of the words in the expression, such as *couch potato*) to determine the meaning of words and phrases.

4.1.3 Use knowledge of root words (*nation, national, nationality*) to determine the meaning of unknown words within a passage.

4.1.4 Use common roots (*meter = measure*) and word parts (*therm = heat*) derived from Greek and Latin to analyze the meaning of complex words (*thermometer*).

4.1.5 Use a thesaurus to find related words and ideas.

4.1.6 Distinguish and interpret words with multiple meanings (*quarters*) by using context clues (the meaning of the text around a word).

Standard 2

READING: Comprehension

Students read and understand grade-level-appropriate material. They use a variety of comprehension strategies, such as asking and responding to essential questions, making predictions, and comparing information from several sources to understand what is read. The selections in the **Indiana Reading List** *(available online at www.doe.state.in.us/standards/readinglist.html) illustrate the quality and complexity of the materials to be read by students. At Grade 4, in addition to regular classroom reading, students read a variety of grade-level-appropriate narrative (story) and expository (informational and technical) texts, including classic and contemporary literature, poetry, magazines, newspapers, reference materials, and online information.*

Structural Features of Informational and Technical Materials

4.2.1 Use the organization of informational text to strengthen comprehension.

Example: Read informational texts that are organized by comparing and contrasting ideas, by discussing causes for and effects of events, or by sequential order and use this organization to understand what is read. Use graphic organizers, such as webs, flow charts, concept maps, or Venn diagrams to show the organization of the text.

Comprehension and Analysis of Grade-Level-Appropriate Text

4.2.2 Use appropriate strategies when reading for different purposes.

Example: Read and take notes on an informational text that will be used for a report. Skim a text to locate specific information. Use graphic organizers to show the relationship of ideas in the text.

4.2.3 Make and confirm predictions about text by using prior knowledge and ideas presented in the text itself, including illustrations, titles, topic sentences, important words, foreshadowing clues (clues that indicate what might happen next), and direct quotations.

Example: While reading a mystery, such as *Encyclopedia Brown: Boy Detective* by Donald Sobol, predict what is going to happen next in the story. Confirm or revise the predictions based on further reading. After reading an informational text, such as *Camouflage: A Closer Look* by Joyce Powzyk, use information gained from the text to predict what an animal might do to camouflage itself in different landscapes.

4.2.4 Evaluate new information and hypotheses (statements of theories or assumptions) by testing them against known information and ideas.

Example: Compare what is already known and thought about ocean life to new information encountered in reading, such as in the book *Amazing Sea Creatures* by Andrew Brown.

4.2.5 Compare and contrast information on the same topic after reading several passages or articles.

Example: Read several fictional and informational texts about guide dogs, such as *A Guide Dog Puppy Grows Up* by Carolyn Arnold, *Buddy: The First Seeing Eye Dog* by Eva Moore, and *Follow My Leader* by James B. Garfield, and compare and contrast the information presented in each.

4.2.6 Distinguish between cause and effect and between fact and opinion in informational text.

Example: In reading an article about how snowshoe rabbits change color, distinguish facts (such as *Snowshoe rabbits change color from brown to white in the winter*) from opinions (such as *Snowshoe rabbits are very pretty animals because they can change colors*).

4.2.7 Follow multiple-step instructions in a basic technical manual.

Example: Follow directions to learn how to use computer commands or play a video game.

Standard 3

READING: Literary Response and Analysis

Students read and respond to a wide variety of significant works of children's literature. They identify and discuss the characters, theme (the main idea of a story), plot (what happens in a story), and the setting (where a story takes place) of stories that they read. The selections in the **Indiana Reading List** *(available online at www.doe.state.in.us/standards/readinglist.html) illustrate the quality and complexity of the materials to be read by students.*

Structural Features of Literature

4.3.1 Describe the differences of various imaginative forms of literature, including fantasies, fables, myths, legends, and fairy tales.

Example: Show how fables were often told to teach a lesson, as in Aesop's fable, *The Grasshopper and the Ant*. Discuss how legends were often told to explain natural history, as in the stories about *Johnny Appleseed* or *Paul Bunyan and Babe, the Blue Ox*. Use a graphic organizer to compare the two types of literature.

Narrative Analysis of Grade-Level-Appropriate Text

4.3.2 Identify the main events of the plot, including their causes and the effects of each event on future actions, and the major theme from the story action.

Example: After reading *Sarah, Plain and Tall* by Patricia MacLachlan, discuss the causes and effects of the main event of the plot, when the father in the story acquires a mail-order bride. Describe the effects of this event, including the adjustments that the children make to their new stepmother and that Sarah makes to living on the prairie. Plot the story onto a story map, and write a sentence identifying the major theme.

4.3.3 Use knowledge of the situation, setting, and a character's traits, motivations, and feelings to determine the causes for that character's actions.

Example: After reading *The Sign of the Beaver* by Elizabeth George Speare, tell how the Native American character's actions are influenced by his being in a setting with which he is very familiar and feels comfortable, as opposed to the reactions of another character, Matt.

4.3.4 Compare and contrast tales from different cultures by tracing the adventures of one character type. Tell why there are similar tales in different cultures.

Example: Read a book of trickster tales from other countries, such as *The Barefoot Book of Trickster Tales* retold by Richard Walker. Describe the similarities in these tales in which a main character, often an animal, outwits other animals, humans, or forces in nature. Then, tell how these tales are different from each other.

4.3.5 Define figurative language, such as similes, metaphors, hyperbole, or personification, and identify its use in literary works.

- Simile: a comparison that uses *like* or *as*
- Metaphor: an implied comparison
- Hyperbole: an exaggeration for effect
- Personification: a description that represents a thing as a person

Example: Identify a simile, such as *Twinkle, twinkle little star...like a diamond in the sky*. Identify a metaphor, such as *You were the wind beneath my wings*. Identify an example of hyperbole, such as *Cleaner than clean, whiter than white*. Identify an example of personification, such as *The North Wind told the girl that he would blow so hard it would be impossible to walk up the steep hill*.

Standard 4

WRITING: Process

Students write clear sentences and paragraphs that develop a central idea. Students progress through the stages of the writing process, including prewriting, drafting, revising, and editing multiple drafts.

Organization and Focus

4.4.1 Discuss ideas for writing. Find ideas for writing in conversations with others and in books, magazines, newspapers, school textbooks, or on the Internet. Keep a list or notebook of ideas.

4.4.2 Select a focus, an organizational structure, and a point of view based upon purpose, audience, length, and format requirements for a piece of writing.

4.4.3 Write informational pieces with multiple paragraphs that:
- provide an introductory paragraph.
- establish and support a central idea with a topic sentence at or near the beginning of the first paragraph.
- include supporting paragraphs with simple facts, details, and explanations.
- present important ideas or events in sequence or in chronological order.
- provide details and transitions to link paragraphs.
- conclude with a paragraph that summarizes the points.
- use correct indention at the beginning of paragraphs.

4.4.4 Use common organizational structures for providing information in writing, such as chronological order, cause and effect, or similarity and difference, and posing and answering a question.

Research and Technology

4.4.5 Quote or paraphrase information sources, citing them appropriately.

4.4.6 Locate information in reference texts by using organizational features, such as prefaces and appendixes.

4.4.7 Use multiple reference materials and online information (the Internet) as aids to writing.

4.4.8 Understand the organization of almanacs, newspapers, and periodicals and how to use those print materials.

4.4.9 Use a computer to draft, revise, and publish writing, demonstrating basic keyboarding skills and familiarity with common computer terminology.

Evaluation and Revision

4.4.10 Review, evaluate, and revise writing for meaning and clarity.

4.4.11 Proofread one's own writing, as well as that of others, using an editing checklist or set of rules, with specific examples of corrections of frequent errors.

4.4.12 Revise writing by combining and moving sentences and paragraphs to improve the focus and progression of ideas.

Standard 5

WRITING: Applications

(Different Types of Writing and Their Characteristics)

At Grade 4, students are introduced to writing informational reports and responses to literature. Students continue to write compositions that describe and explain familiar objects, events, and experiences. Student writing demonstrates a command of Standard English and the drafting, research, and organizational strategies outlined in Standard 4 — Writing Process. Writing demonstrates an awareness of the audience (intended reader) and purpose for writing.

In addition to producing the different writing forms introduced in earlier grades, such as letters, Grade 4 students use the writing strategies outlined in Standard 4 — Writing Process to:

4.5.1 Write narratives (stories) that:
- include ideas, observations, or memories of an event or experience.
- provide a context to allow the reader to imagine the world of the event or experience.
- use concrete sensory details.

Example: Prepare a narrative on how and why immigrants come to the United States. To make the story more realistic, use information from an older person who may remember firsthand the experience of coming to America.

4.5.2 Write responses to literature that:
- demonstrate an understanding of a literary work.
- support judgments through references to both the text and prior knowledge.

Example: Write a description of a favorite character in a book. Include examples from the book to show why this character is such a favorite.

4.5.3 Write informational reports that:
- ask a central question about an issue or situation.
- include facts and details for focus.
- use more than one source of information, including speakers, books, newspapers, media sources, and online information.

Example: Use information from a variety of sources, such as speakers, books, newspapers, media sources, and the Internet, to provide facts and details for a report on life in your town when it was first settled or for a report about the water cycle.

4.5.4 Write summaries that contain the main ideas of the reading selection and the most significant details.

Example: Write a book review, including enough examples and details about the plot, character, and setting of the book to describe it to a reader who is unfamiliar with it.

4.5.5 Use varied word choices to make writing interesting.

Example: Write stories using descriptive words in place of common words; for instance, use *enormous, gigantic,* or *giant* for the word *big*.

4.5.6 Write for different purposes (information, persuasion) and to a specific audience or person.

Example: Write a persuasive report for your class about your hobby or interest. Use charts or pictures, when appropriate, to help motivate your audience to take up your hobby or interest.

Standard 6

WRITING: English Language Conventions

Students write using Standard English conventions appropriate to this grade level.

Handwriting

4.6.1 Write smoothly and legibly in cursive, forming letters and words that can be read by others.

Sentence Structure

4.6.2 Use simple sentences (*Dr. Vincent Stone is my dentist.*) and compound sentences (*His assistant cleans my teeth, and Dr. Stone checks for cavities.*) in writing.

4.6.3 Create interesting sentences by using words that describe, explain, or provide additional details and connections, such as adjectives, adverbs, appositives, participial phrases, prepositional phrases, and conjunctions.

- Adjectives: *brown eyes, younger sisters*
- Adverbs: We walked *slowly*.
- Appositives: noun phrases that function as adjectives, such as *We played the Cougars, the team from Newport.*
- Participial phrases: verb phrases that function as adjectives, such as *The man walking down the street saw the delivery truck.*
- Prepositional phrases: *in the field, across the room, over the fence*
- Conjunctions: *and, or, but*

Grammar

4.6.4 Identify and use in writing regular (*live/lived, shout/shouted*) and irregular verbs (*swim/swam, ride/rode, hit/hit*), adverbs (*constantly, quickly*), and prepositions (*through, beyond, between*).

Punctuation

4.6.5 Use parentheses to explain something that is not considered of primary importance to the sentence, commas in direct quotations (*He said, "I'd be happy to go."*), apostrophes to show possession (*Jim's shoes, the dog's food*), and apostrophes in contractions (*can't, didn't, won't*).

4.6.6 Use underlining, quotation marks, or italics to identify titles of documents.

- When writing by hand or by computer, use quotation marks to identify the titles of articles, short stories, poems, or chapters of books.
- When writing on a computer *italicize* the following, when writing by hand underline them: the titles of books, names of newspapers and magazines, works of art, and musical compositions.

Capitalization

4.6.7 Capitalize names of magazines, newspapers, works of art, musical compositions, organizations, and the first word in quotations, when appropriate.

Spelling

4.6.8 Spell correctly roots (bases of words, such as *unnecessary, cowardly*), inflections (words like *care/careful/caring*) or words with more than one acceptable spelling like (*advisor/adviser*), suffixes and prefixes (*-ly, -ness, mis-, un-*), and syllables (word parts each containing a vowel sound, such as *sur•prise* or *e•col•o•gy*).

Standard 7

LISTENING AND SPEAKING: Skills, Strategies, and Applications

Students listen critically and respond appropriately to oral communication. They speak in a manner that guides the listener to understand important ideas by using proper phrasing, pitch, and modulation (raising and lowering voice). Students deliver brief oral presentations about familiar experiences or interests that are organized around a coherent thesis statement (a statement of topic). Students use the same Standard English conventions for oral speech that they use in their writing.

Comprehension

4.7.1 Ask thoughtful questions and respond orally to relevant questions with appropriate elaboration.

4.7.2 Summarize major ideas and supporting evidence presented in spoken presentations.

4.7.3 Identify how language usage (sayings and expressions) reflects regions and cultures.

4.7.4 Give precise directions and instructions.

Organization and Delivery of Oral Communication

4.7.5 Present effective introductions and conclusions that guide and inform the listener's understanding of important ideas and details.

4.7.6 Use traditional structures for conveying information, including cause and effect, similarity and difference, and posing and answering a question.

4.7.7 Emphasize points in ways that help the listener or viewer to follow important ideas and concepts.

4.7.8 Use details, examples, anecdotes (stories of a specific event), or experiences to explain or clarify information.

4.7.9 Engage the audience with appropriate words, facial expressions, and gestures.

Analysis and Evaluation of Oral Media Communication

4.7.10 Evaluate the role of the media in focusing people's attention on events and in forming their opinions on issues.

Speaking Applications

4.7.11 Make narrative (story) presentations that:
- relate ideas, observations, or memories about an event or experience.
- provide a context that allows the listener to imagine the circumstances of the event or experience.
- provide insight into why the selected event or experience should be of interest to the audience.

4.7.12 Make informational presentations that:
- focus on one main topic.
- include facts and details that help listeners to focus.
- incorporate more than one source of information (including speakers, books, newspapers, television broadcasts, radio reports, or Web sites).

4.7.13 Deliver oral summaries of articles and books that contain the main ideas of the event or article and the most significant details.

4.7.14 Recite brief poems (two or three stanzas long), soliloquies (sections of plays in which characters speak out loud to themselves), or dramatic dialogues, clearly stating words and using appropriate timing, volume, and phrasing.

NOTES

Grade 4

Mathematics

Mathematics

In this technological age, mathematics is more important than ever. When students leave school, they are more and more likely to use mathematics in their work and everyday lives — operating computer equipment, planning timelines and schedules, reading and interpreting data, comparing prices, managing personal finances, and completing other problem-solving tasks. What they learn in mathematics and how they learn it will provide an excellent preparation for a challenging and ever-changing future.

The state of Indiana has established the following mathematics Standards to make clear to teachers, students, and parents what knowledge, understanding, and skills students should acquire in Grade 4:

Standard 1 — Number Sense

Understanding the number system is the basis of mathematics. Students extend their understanding of the place value system to count, read, and write whole numbers up to 1,000,000 and decimals to two places. They order and compare whole numbers using the correct symbols for greater than and less than. They extend the concept of fractions to mixed numbers, learning how fractions are related to whole numbers. They also extend their skills with decimals and how they relate to fractions.

Standard 2 — Computation

Fluency in computation is essential. As students learn about numbers, they also learn how to add, subtract, multiply, and divide them. They understand the special roles of 0 and 1 in multiplication and division. They also add and subtract fractions and decimals, learning how these different representations of numbers can be manipulated.

Standard 3 — Algebra and Functions

Algebra is a language of patterns, rules, and symbols. Students at this level develop an understanding of the fundamental concept of a variable — having a letter represent all numbers of a certain kind. They use this to write formulas and equations, including equations that give the rule for a function. They continue number patterns involving multiplication and division. They recognize and apply the relationships among the four operations of addition, subtraction, multiplication, and division. They further develop the connection between numbers and number lines, including estimating positions on a number line.

Standard 4 — Geometry

Students learn about geometric shapes and develop a sense of space. They identify, describe, and draw such concepts as acute angles and parallel lines. They describe shapes and objects, including special quadrilaterals such as rhombuses and trapezoids. They identify congruent quadrilaterals and explain their reasoning using specific geometric terms. They draw lines of symmetry for various polygons, and they construct cubes and prisms, developing their ability to work in three dimensions.

Standard 5 — Measurement

The study of measurement is essential because of its uses in many aspects of everyday life. Students measure length to the nearest eighth-inch and millimeter and subtract units of length. They develop and use the formulas for calculating perimeters and areas of rectangles. They compare the concepts of volume and capacity. They add time intervals and calculate the amount of change from a purchase.

Standard 6 — Data Analysis and Probability

Data are all around us — in newspapers and magazines, in television news and commercials, in quality control for manufacturing — and students need to learn how to understand data. At this level, they represent data on a number line and in frequency tables, interpret data graphs to answer questions, and summarize the results of probability experiments in an organized way.

Standard 7 — Problem Solving

In a general sense, mathematics is problem solving. In all mathematics, students use problem-solving skills: they choose how to approach a problem, they explain their reasoning, and they check their results. As they develop their skills with numbers, geometry, or measurement, for example, students move from simple ideas to more complex ones by taking logical steps that build a better understanding of mathematics.

As part of their instruction and assessment, students should also develop the following learning skills by Grade 12 that are woven throughout the mathematics Standards:

Communication

The ability to read, write, listen, ask questions, think, and communicate about math will develop and deepen students' understanding of mathematical concepts. Students should read text, data, tables, and graphs with comprehension and understanding. Their writing should be detailed and coherent, and they should use correct mathematical vocabulary. Students should write to explain answers, justify mathematical reasoning, and describe problem-solving strategies.

Reasoning and Proof

Mathematics is developed by using known ideas and concepts to develop others. Repeated addition becomes multiplication. Multiplication of numbers less than ten can be extended to numbers less than one hundred and then to the entire number system. Knowing how to find the area of a right triangle extends to all right triangles. Extending patterns, finding even numbers, developing formulas, and proving the Pythagorean Theorem are all examples of mathematical reasoning. Students should learn to observe, generalize, make assumptions from known information, and test their assumptions.

Representation

The language of mathematics is expressed in words, symbols, formulas, equations, graphs, and data displays. The concept of one-fourth may be described as a quarter, ¼, one divided by four, 0.25, ⅛ + ⅛, 25 percent, or an appropriately shaded portion of a pie graph. Higher-level mathematics involves the use of more powerful representations: exponents, logarithms, π, unknowns, statistical representation, algebraic and geometric expressions. Mathematical operations are expressed as representations: +, −, divide, square. Representations are dynamic tools for solving problems and communicating and expressing mathematical ideas and concepts.

Connections

Connecting mathematical concepts includes linking new ideas to related ideas learned previously, helping students to see mathematics as a unified body of knowledge whose concepts build upon each other. Major emphasis should be given to ideas and concepts across mathematical content areas that help students see that mathematics is a web of closely connected ideas (algebra, geometry, the entire number system). Mathematics is also the common language of many other disciplines (science, technology, finance, social science, geography) and students should learn mathematical concepts used in those disciplines. Finally, students should connect their mathematical learning to appropriate real-world contexts.

Standard 1

Number Sense

Students understand the place value of whole numbers and decimals to two decimal places and how whole numbers and decimals relate to simple fractions.*

4.1.1 Read and write whole numbers up to 1,000,000.

Example: Read aloud the number 394,734.

4.1.2 Identify and write whole numbers up to 1,000,000, given a place-value model.

Example: Write the number that has 2 hundred thousands, 7 ten thousands, 4 thousands, 8 hundreds, 6 tens, and 2 ones.

4.1.3 Round whole numbers up to 10,000 to the nearest ten, hundred, and thousand.

Example: Is 7,683 closer to 7,600 or 7,700? Explain your answer.

4.1.4 Order and compare whole numbers using symbols for "less than" (<), "equal to" (=), and "greater than" (>).

Example: Put the correct symbol in 328 __ 142.

4.1.5 Rename and rewrite whole numbers as fractions.

Example: $3 = \frac{6}{2} = \frac{9}{3} = \frac{7}{4} = \frac{7}{5}$.

4.1.6 Name and write mixed numbers, using objects or pictures.

Example: You have 5 whole straws and half a straw. Write the number that represents these objects.

4.1.7 Name and write mixed numbers as improper fractions, using objects or pictures.

Example: Use a picture of 3 rectangles, each divided into 5 equal pieces, to write $2\frac{3}{5}$ as an improper fraction.

4.1.8 Write tenths and hundredths in decimal and fraction notations. Know the fraction and decimal equivalents for halves and fourths (e.g., $\frac{1}{2} = 0.5 = 0.50$, $\frac{7}{4} = 1\frac{3}{4} = 1.75$).

Example: Write $\frac{26}{100}$ and $2\frac{3}{4}$ as decimals.

4.1.9 Round two-place decimals to tenths or to the nearest whole number.

Example: You ran the 50-yard dash in 6.73 seconds. Round your time to the nearest tenth.

* whole numbers: 0, 1, 2, 3, etc.

Standard 2

Computation

Students solve problems involving addition, subtraction, multiplication, and division of whole numbers and understand the relationships among these operations. They extend their use and understanding of whole numbers to the addition and subtraction of simple fractions and decimals.

4.2.1 Understand and use standard algorithms* for addition and subtraction.

Example: 45,329 + 6,984 = ?, 36,296 − 12,075 = ?

4.2.2 Represent as multiplication any situation involving repeated addition.

Example: Each of the 20 students in your physical education class has 3 tennis balls. Find the total number of tennis balls in the class.

4.2.3 Represent as division any situation involving the sharing of objects or the number of groups of shared objects.

Example: Divide 12 cookies equally among 4 students. Divide 12 cookies equally so that each person gets 4 cookies. Compare your answers and methods.

4.2.4 Demonstrate mastery of the multiplication tables for numbers between 1 and 10 and of the corresponding division facts.

Example: Know the answers to 9×4 and $35 \div 7$.

4.2.5 Use a standard algorithm to multiply numbers up to 100 by numbers up to 10, using relevant properties of the number system.

Example: $67 \times 3 = ?$

4.2.6 Use a standard algorithm to divide numbers up to 100 by numbers up to 10 without remainders, using relevant properties of the number system.

Example: $69 \div 3 = ?$

4.2.7 Understand the special properties of 0 and 1 in multiplication and division.

Example: Know that $73 \times 0 = 0$ and that $42 \div 1 = 42$.

4.2.8 Add and subtract simple fractions with different denominators, using objects or pictures.

Example: Use a picture of a circle divided into 6 equal pieces to find $\frac{5}{6} - \frac{1}{3}$.

4.2.9 Add and subtract decimals (to hundredths), using objects or pictures.

Example: Use coins to help you find \$0.43 − \$0.29.

4.2.10 Use a standard algorithm to add and subtract decimals (to hundredths).

Example: 0.74 + 0.80 = ?

4.2.11 Know and use strategies for estimating results of any whole-number computations.

Example: Your friend says that 45,329 + 6,984 = 5,213. Without solving, explain why you think the answer is wrong.

4.2.12 Use mental arithmetic to add or subtract numbers rounded to hundreds or thousands.

Example: Add 3,000 to 8,000 without using pencil and paper.

* algorithm: a step-by-step procedure for solving a problem.

Standard 3

Algebra and Functions

Students use and interpret variables, mathematical symbols, and properties to write and simplify numerical expressions and sentences. They understand relationships among the operations of addition, subtraction, multiplication, and division.

4.3.1 **Use letters, boxes, or other symbols to represent any number in simple expressions, equations, or inequalities (i.e., demonstrate an understanding of and the use of the concept of a variable).**

Example: In the expression $3x + 5$, what does x represent?

4.3.2 **Use and interpret formulas to answer questions about quantities and their relationships.**

Example: Write the formula for the area of a rectangle in words. Now let l stand for the length, w for the width, and A for the area. Write the formula using these symbols.

4.3.3 **Understand that multiplication and division are performed before addition and subtraction in expressions without parentheses.**

Example: You go to a store with 90¢ and buy 3 pencils that cost 20¢ each. Write an expression for the amount of money you have left and find its value.

4.3.4 **Understand that an equation such as y = 3x + 5 is a rule for finding a second number when a first number is given.**

Example: Use the formula $y = 3x + 5$ to find the value of y when $x = 6$.

4.3.5 **Continue number patterns using multiplication and division.**

Example: What is the next number: 160, 80, 40, 20, ...? Explain your answer.

4.3.6 **Recognize and apply the relationships between addition and multiplication, between subtraction and division, and the inverse relationship between multiplication and division to solve problems.**

Example: Find another way of writing 13 + 13 + 13 + 13 + 13.

4.3.7 **Relate problem situations to number sentences involving multiplication and division.**

Example: You have 150 jelly beans to share among the 30 members of your class. Write a number sentence for this problem and use it to find the number of jelly beans each person will get.

4.3.8 **Plot and label whole numbers on a number line up to 100. Estimate positions on the number line.**

Example: Draw a number line and label it with 0, 10, 20, 30, ..., 90, 100. Estimate the position of 77 on this number line.

Standard 4

Geometry

Students show an understanding of plane and solid geometric objects and use this knowledge to show relationships and solve problems.

4.4.1 Identify, describe, and draw rays, right angles, acute angles, obtuse angles and straight angles using appropriate mathematical tools and technology.

Example: Draw two rays that meet in an obtuse angle.

4.4.2 Identify, describe and draw parallel, perpendicular, and oblique lines using appropriate mathematical tools and technology.

Example: Use the markings on the gymnasium floor to identify two lines that are parallel. Place a jump rope across the parallel lines and identify any obtuse angles created by the jump rope and the lines.

4.4.3 Identify, describe, and draw parallelograms*, rhombuses*, and trapezoids*, using appropriate mathematical tools and technology.

Example: Use a geoboard to make a parallelogram. How do you know it is a parallelogram?

4.4.4 Identify congruent* quadrilaterals* and give reasons for congruence using sides, angles, parallels and perpendiculars.

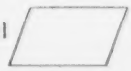
Example: In a collection of parallelograms, rhombuses, and trapezoids, pick out those that are the same shape and size and explain your decisions.

4.4.5 Identify and draw lines of symmetry in polygons.

Example: Draw a rectangle and then draw all its lines of symmetry.

4.4.6 Construct cubes and prisms* and describe their attributes.

Example: Make a 6-sided prism from construction paper.

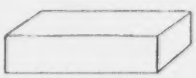
* parallelogram: a four-sided figure with both pairs of opposite sides parallel 

* rhombus: a parallelogram with all sides equal

* trapezoid: a four-sided figure with one pair of opposite sides parallel

* congruent: two figures that are the same shape and size

* quadrilateral: a two-dimensional figure with four sides

* prism: solid shape with fixed cross-section (right prism is a solid shape with two parallel faces that are congruent polygons and other faces that are rectangles) 

Standard 5

Measurement

Students understand perimeter and area, as well as measuring volume, capacity, time, and money.

4.5.1 Measure length to the nearest quarter-inch, eighth-inch, and millimeter.

Example: Measure the width of a sheet of paper to the nearest millimeter.

4.5.2 Subtract units of length that may require renaming of feet to inches or meters to centimeters.

Example: The shelf was 2 feet long. Jane shortened it by 8 inches. How long is the shelf now?

4.5.3 Know and use formulas for finding the perimeters of rectangles and squares.

Example: The length of a rectangle is 4 cm and its perimeter is 20 cm. What is the width of the rectangle?

4.5.4 Know and use formulas for finding the areas of rectangles and squares.

Example: Draw a rectangle 5 inches by 3 inches. Divide it into one-inch squares and count the squares to find its area. Can you see another way to find the area? Do this with other rectangles.

4.5.5 Estimate and calculate the area of rectangular shapes by using appropriate units, such as square centimeter (cm^2), square meter (m^2), square inch (in^2), or square yard (yd^2).

Example: Measure the length and width of a basketball court and find its area in suitable units.

4.5.6 Understand that rectangles with the same area can have different perimeters and that rectangles with the same perimeter can have different areas.

Example: Make a rectangle of area 12 units on a geoboard and find its perimeter. Can you make other rectangles with the same area? What are their perimeters?

4.5.7 Find areas of shapes by dividing them into basic shapes such as rectangles.

Example: Find the area of your school building.

4.5.8 Use volume and capacity as different ways of measuring the space inside a shape.

Example: Use cubes to find the volume of a fish tank and a pint jug to find its capacity.

4.5.9 Add time intervals involving hours and minutes.

Example: During the school week, you have 5 recess periods of 15 minutes. Find how long that is in hours and minutes.

4.5.10 Determin[illegible] amount of change from a purchase.

Example: You buy a chocolate bar priced at $1.75. How much change do you get if you pay for it with a five-dollar bill?

Standard 6

Data Analysis and Probability

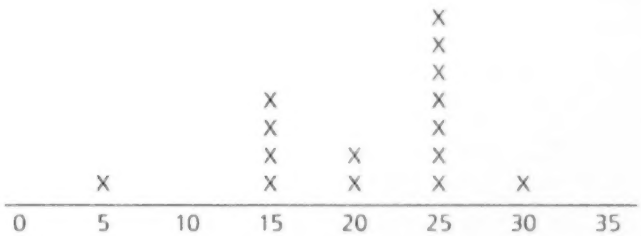
Students organize, represent, and interpret numerical and categorical data and clearly communicate their findings. They show outcomes for simple probability situations.

4.6.1 **Represent data on a number line and in tables, including frequency tables.**

Example: The students in your class are growing plants in various parts of the classroom. Plan a survey to measure the height of each plant in centimeters on a certain day. Record your survey results on a line plot.

4.6.2 **Interpret data graphs to answer questions about a situation.**

Example: The line plot below shows the heights of fast-growing plants reported by third-grade students. Describe any patterns that you can see in the data using the words "most," "few," and "none."



Plant Heights in Centimeters

4.6.3 **Summarize and display the results of probability experiments in a clear and organized way.**

Example: Roll a number cube 36 times and keep a tally of the number of times that 1, 2, 3, 4, 5, and 6 appear. Draw a bar graph to show your results.

Standard 7

Problem Solving

Students make decisions about how to approach problems and communicate their ideas.

4.7.1 Analyze problems by identifying relationships, telling relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.

Example: Solve the problem: "Find a relationship between the number of faces, edges, and vertices of a solid shape with flat surfaces." Try two or three shapes and look for patterns.

4.7.2 Decide when and how to break a problem into simpler parts.

Example: In the first example, find what happens to cubes and rectangular solids.

Students use strategies, skills, and concepts in finding and communicating solutions to problems.

4.7.3 Apply strategies and results from simpler problems to solve more complex problems.

Example: In the first example, use your method for cubes and rectangular solids to find what happens to other prisms and to pyramids.

4.7.4 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, tools, and models to solve problems, justify arguments, and make conjectures.

Example: In the first example, make a table to help you explain your results to another student.

4.7.5 Express solutions clearly and logically by using the appropriate mathematical terms and notation. Support solutions with evidence in both verbal and symbolic work.

Example: In the first example, explain what happens with all the shapes that you tried.

4.7.6 Recognize the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.

Example: You are telling a friend the time of a TV program. How accurate should you be: to the nearest day, hour, minute, or second?

4.7.7 Know and use appropriate methods for estimating results of whole-number computations.

Example: You buy 2 CDs for $15.95 each. The cashier tells you that will be $49.90. Does that surprise you?

4.7.8 Make precise calculations and check the validity of the results in the context of the problem.

Example: The buses you use for a school trip hold 55 people each. How many buses will you need to seat 180 people?

Students determine when a solution is complete and reasonable and move beyond a particular problem by generalizing to other situations.

4.7.9 Decide whether a solution is reasonable in the context of the original situation.

Example: In the last example, would an answer of 3.27 surprise you?

4.7.10 Note the method of finding the solution and show a conceptual understanding of the method by solving similar problems.

Example: Change the first example so that you look at shapes with curved surfaces.

Grade 4

Science

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Science

The Indiana Academic Standards for science contain six Standards. Each Standard is described below. On the pages that follow, age-appropriate concepts are listed underneath each Standard. These ideas build a foundation for understanding the intent of each Standard.

Standard 1 — The Nature of Science and Technology

It is the union of science and technology that forms the scientific endeavor and that makes it so successful. Although each of these human enterprises has a character and history of its own, each is dependent on and reinforces the other. This first Standard draws portraits of science and technology that emphasize their roles in the scientific endeavor and reveal some of the similarities and connections between them. In order for students to truly understand the nature of science and technology, they must model the process of scientific investigation through inquiries, fieldwork, lab work, etc. Through these experiences, students will practice designing investigations and experiments, making observations, and formulating theories based on evidence.

Standard 2 — Scientific Thinking

There are certain thinking skills associated with science, mathematics, and technology that young people need to develop during their school years. These are mostly, but not exclusively, mathematical and logical skills that are essential tools for both formal and informal learning and for a lifetime of participation in society as a whole. Good communication is also essential in order to both receive and disseminate information and to understand others' ideas as well as have one's own ideas understood. Writing, in the form of journals, essays, lab reports, procedural summaries, etc., should be an integral component of students' experiences in science.

Standard 3 — The Physical Setting

One of the grand success stories of science is the unification of the physical universe. It turns out that all natural objects, events, and processes are connected to each other. This Standard contains recommendations for basic knowledge about the overall structure of the universe and the physical principles on which it seems to run, with emphasis on Earth and the solar system. This Standard focuses on two principle subjects: the structure of the universe and the major processes that have shaped planet Earth, and the concepts with which science describes the physical world in general – organized under the headings of *Matter and Energy* and *Forces of Nature*. In Grade 4, students learn that the properties of rocks reflect the processes that formed them. They investigate force and energy.

Standard 4 — The Living Environment

People have long been curious about living things – how many different species there are, what they are like, how they relate to each other, and how they behave. Living organisms are made of the same components as all other matter, involve the same kinds of transformations of energy, and move using the same basic kinds of forces. Thus, all of the physical principles discussed in Standard 3 – The Physical Setting, apply to life as well as to stars, raindrops, and television sets. This Standard offers recommendations on basic knowledge about how living things function and how they interact with one another and their environment. In Grade 4, students learn that all organisms need energy and matter to live and grow.

Standard 5 — The Mathematical World

Mathematics is essentially a process of thinking that involves building and applying abstract, logically connected networks of ideas. These ideas often arise from the need to solve problems in science, technology, and everyday life — problems ranging from how to model certain aspects of a complex scientific problem to how to balance a checkbook.

Standard 6 — Common Themes

Some important themes pervade science, mathematics, and technology and appear over and over again, whether we are looking at ancient civilization, the human body, or a comet. These ideas transcend disciplinary boundaries and prove fruitful in explanation, in theory, in observation, and in design. A focus on *Constancy and Change* within this Standard provides students opportunities to engage in long-term and on-going laboratory and fieldwork, and thus understand the role of change over time in studying The Physical Setting and The Living Environment.

Standard 1

The Nature of Science and Technology

Students, working collaboratively, carry out investigations. They observe and make accurate measurements, increase their use of tools and instruments, record data in journals, and communicate results through chart, graph, written, and verbal forms.

The Scientific View of the World

4.1.1 Observe and describe that scientific investigations generally work the same way in different places.

Scientific Inquiry

4.1.2 Recognize and describe that results of scientific investigations are seldom exactly the same. If differences occur, such as a large variation in the measurement of plant growth, propose reasons for why these differences exist, using recorded information about investigations.

The Scientific Enterprise

4.1.3 Explain that clear communication is an essential part of doing science since it enables scientists to inform others about their work, to expose their ideas to evaluation by other scientists, and to allow scientists to stay informed about scientific discoveries around the world.

4.1.4 Describe how people all over the world have taken part in scientific investigation for many centuries.

Technology and Science

4.1.5 Demonstrate how measuring instruments, such as microscopes, telescopes, and cameras, can be used to gather accurate information for making scientific comparisons of objects and events. Note that measuring instruments, such as rulers, can also be used for designing and constructing things that will work properly.

4.1.6 Explain that even a good design may fail even though steps are taken ahead of time to reduce the likelihood of failure.

4.1.7 Discuss and give examples of how technology, such as computers and medicines, has improved the lives of many people, although the benefits are not equally available to all.

4.1.8 Recognize and explain that any invention may lead to other inventions.

4.1.9 Explain how some products and materials are easier to recycle than others.

Standard 2

Scientific Thinking

Students use a variety of skills and techniques when attempting to answer questions and solve problems. They describe their observations accurately and clearly, using numbers, words, and sketches, and are able to communicate their thinking to others. They compare, explain, and justify both information and numerical functions.*

Computation and Estimation

4.2.1 Judge whether measurements and computations of quantities, such as length, area*, volume*, weight, or time, are reasonable.

4.2.2 State the purpose, orally or in writing, of each step in a computation.

* observation: gaining information through the use of one or more of the senses, such as sight, smell, etc.

* area: a measure of the size of a two-dimensional region

* volume: a measure of the size of a three-dimensional object

Manipulation and Observation

4.2.3 Make simple and safe electrical connections with various plugs, sockets, and terminals.

Communication Skills

4.2.4 Use numerical data to describe and compare objects and events.

4.2.5 Write descriptions of investigations, using observations and other evidence as support for explanations.

Critical Response Skills

4.2.6 Support statements with facts found in print and electronic media, identify the sources used, and expect others to do the same.

4.2.7 Identify better reasons for believing something than "Everybody knows that ..." or "I just know," and discount such reasons when given by others.

Standard 3

The Physical Setting

Students continue to investigate changes of Earth and the sky and begin to understand the composition and size of the universe. They explore, describe, and classify materials, motion, and energy*.*

The Universe

4.3.1 Observe and report that the moon can be seen sometimes at night and sometimes during the day.

* motion: the change in position of an object in a certain amount of time
* energy: what is needed to do work

The Earth and the Processes That Shape It

4.3.2 Begin to investigate and explain that air is a substance that surrounds us, takes up space, and whose movements we feel as wind.

4.3.3 Identify salt as the major difference between fresh and ocean waters.

4.3.4 Describe some of the effects of oceans on climate.

4.3.5 Describe how waves, wind, water, and glacial ice shape and reshape Earth's land surface by the erosion* of rock and soil in some areas and depositing them in other areas.

4.3.6 Recognize and describe that rock is composed of different combinations of minerals.

4.3.7 Explain that smaller rocks come from the breakage and weathering of bedrock and larger rocks and that soil is made partly from weathered rock, partly from plant remains, and also contains many living organisms.

4.3.8 Explain that the rotation of Earth on its axis every 24 hours produces the night-and-day cycle.

4.3.9 Draw or correctly select drawings of shadows and their direction and length at different times of day.

* erosion: the process by which the products of weathering* are moved from one place to another
* weathering: breaking down of rocks and other materials on Earth's surface by such processes as rain or wind

Matter* and Energy

4.3.10 Demonstrate that the mass* of a whole object is always the same as the sum of the masses of its parts.

4.3.11 Investigate, observe, and explain that things that give off light often also give off heat*.

4.3.12 Investigate, observe, and explain that heat is produced when one object rubs against another, such as one's hands rubbing together.

4.3.13 Observe and describe the things that give off heat, such as people, animals, and the sun.

4.3.14 Explain that energy in fossil fuels* comes from plants that grew long ago.

* matter: anything that has mass and takes up space
* mass: the amount of matter in an object
* heat: a form of energy
* fossil fuels: a fuel, such as natural gas or coal, that was formed a long time ago from decayed plants and animals

Forces of Nature

4.3.15 Demonstrate that without touching them, a magnet pulls all things made of iron and either pushes or pulls other magnets.

4.3.16 Investigate and describe that without touching them, material that has been electrically charged pulls all other materials and may either push or pull other charged material.

Standard 4

The Living Environment

Students learn about an increasing variety of organisms – familiar, exotic, fossil, and microscopic. They use appropriate tools in identifying similarities and differences among them. They explore how organisms satisfy their needs in their environments.

Diversity of Life

4.4.1 Investigate, such as by using microscopes, to see that living things are made mostly of cells.

Interdependence of Life and Evolution

4.4.2 Investigate, observe, and describe that insects and various other organisms depend on dead plant and animal material for food.

4.4.3 Observe and describe that organisms interact with one another in various ways, such as providing food, pollination, and seed dispersal.

4.4.4 Observe and describe that some source of energy is needed for all organisms to stay alive and grow.

4.4.5 Observe and explain that most plants produce far more seeds than those that actually grow into new plants.

4.4.6 Explain how in all environments, organisms are growing, dying, and decaying, and new organisms are being produced by the old ones.

Human Identity

4.4.7 Describe that human beings have made tools and machines, such as x-rays, microscopes, and computers, to sense and do things that they could not otherwise sense or do at all, or as quickly, or as well.

4.4.8 Know and explain that artifacts and preserved remains provide some evidence of the physical characteristics and possible behavior of human beings who lived a very long time ago.

4.4.9 Explain that food provides energy and materials for growth and repair of body parts. Recognize that vitamins and minerals, present in small amounts in foods, are essential to keep everything working well. Further understand that as people grow up, the amounts and kinds of food and exercise needed by the body may change.

4.4.10 Explain that if germs are able to get inside the body, they may keep it from working properly. Understand that for defense against germs, the human body has tears, saliva, skin, some blood cells, and stomach secretions. Also note that a healthy body can fight most germs that invade it. Recognize, however, that there are some germs that interfere with the body's defenses.

4.4.11 Explain that there are some diseases that human beings can only catch once. Explain that there are many diseases that can be prevented by vaccinations, so that people do not catch them even once.

Standard 5

The Mathematical World

Students apply mathematics in scientific contexts. Their geometric descriptions of objects are comprehensive. They realize that graphing demonstrates specific connections between data. They identify questions that can be answered by data distribution.

Numbers

4.5.1 Explain that the meaning of numerals in many-digit numbers depends on their positions.

4.5.2 Explain that in some situations, "0" means none of something, but in others it may be just the label of some point on a scale.

Shapes and Symbolic Relationships

4.5.3 Illustrate how length can be thought of as unit lengths joined together, area as a collection of unit squares, and volume as a set of unit cubes.

4.5.4 Demonstrate how graphical displays of numbers may make it possible to spot patterns that are not otherwise obvious, such as comparative size and trends.

Reasoning and Uncertainty

4.5.5 Explain how reasoning can be distorted by strong feelings.

Standard 6

Common Themes

Students work with an increasing variety of systems and begin to modify parts in systems and models and notice the changes that result. They question why change occurs.

Systems

4.6.1 Demonstrate that in an object consisting of many parts, the parts usually influence or interact with one another.

4.6.2 Show that something may not work as well, or at all, if a part of it is missing, broken, worn out, mismatched, or incorrectly connected.

Models and Scale

4.6.3 Recognize that and describe how changes made to a model can help predict how the real thing can be altered.

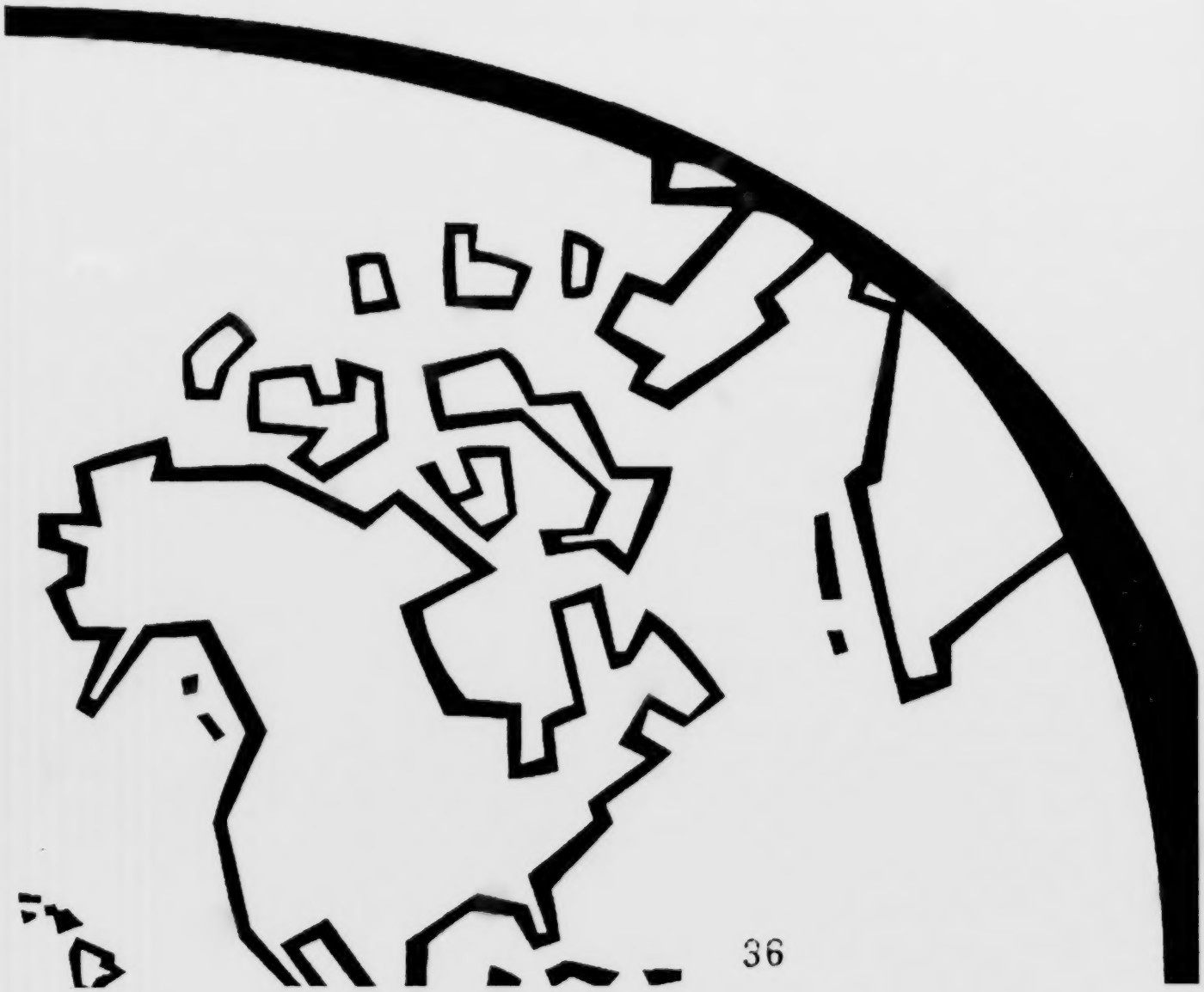
Constancy and Change

4.6.4 Observe and describe that some features of things may stay the same even when other features change.

NOTES

Grade 4

Social Studies



Indiana in the Nation and the World

Students in Grade 4 study Indiana and its relationships to regional, national, and world communities, including the influence of physical and cultural environments on the state's growth and development and principles and practices of citizenship and government in Indiana.

The K – 8 Indiana Academic Standards for social studies are organized around five content areas. The content area Standards and the types of learning experiences they provide to students in Grade 4 are described below. On the pages that follow, age-appropriate concepts are listed underneath each Standard. Skills for thinking, inquiry, and participation in a democratic society are integrated throughout. Specific terms are defined and examples are provided when necessary.

Standard 1 — History

Students will trace the historical periods, places, people, events, and movements that have led to the development of Indiana as a state.

Standard 2 — Civics and Government

Students will describe the components and characteristics of Indiana's constitutional form of government; explain citizenship rights and responsibilities; investigate civic and political issues and problems; use inquiry and communication skills to report findings in charts, graphs, written, and verbal forms; and demonstrate responsible citizenship by exercising civic virtues and participation skills.

Standard 3 — Geography

Students will explain how Earth/sun relationships influence the climate of Indiana; identify the components of Earth's physical systems; describe the major physical and cultural characteristics of Indiana; give examples of how the interaction of people with their environment has changed over time and continues to change; and identify regions of Indiana.

Standard 4 — Economics

Students will study and compare the characteristics of Indiana's changing economy in the past and present.

Standard 5 — Individuals, Society, and Culture

Students will examine the interaction between individual and group behavior in state and community life; analyze the roles and relationships of diverse groups of people contributing to Indiana's cultural heritage; and describe the impacts of science, technology, and the arts on Indiana's culture.

Standard 1

History

Students will trace the historical periods, places, people, events, and movements that have led to the development of Indiana as a state.

Historical Knowledge

American Indians and the Arrival of Europeans to 1770

4.1.1 Identify and compare the major early cultures that existed in the region that became Indiana prior to contact with Europeans.

Example: Angel Mounds (1050 – 1400 C.E.).

4.1.2 Identify and describe historic Indian groups that lived in the region that became Indiana at the time of early European exploration and settlement in the seventeenth century.

Example: The Miami, Shawnee, Potawatomi, and Lenape (Delaware).

The American Revolution and the Indiana Territory: 1770s to 1816

4.1.3 Explain the importance of the Revolutionary War and other key events and people that influenced Indiana's development.

Example: George Rogers Clark and the Fall of Fort Sackville (1779), U.S. land treaties with Indians, Chief Little Turtle, Tecumseh, Tenskwatawa (the Prophet), William Henry Harrison, the Battle of Tippecanoe (1811).

4.1.4 Explain the significance of key documents in Indiana's development from a United States territory to statehood.

Example: The Northwest Ordinance (1787) made Indiana part of the United States territory; the 1816 Indiana Constitution established the first state government.

Statehood and Development: 1816 to 1850s

4.1.5 Describe the removal of Indian groups from Indiana in the 1830s.

4.1.6 Explain how key individuals and events influenced the early growth of the new state of Indiana.

Example: Jonathon Jennings, Robert Owen, John Tipton, William Conner, Frances Slocum, and Sarah Bolton.

Example: Formation of counties, movement of state capitol from Corydon to Indianapolis, canal and road building, the first railroad line (1847), and the Indiana Constitution of 1851.

The Civil War Era: 1850 to 1880s

4.1.7 Explain the roles of various individuals, groups, and movements in the social conflicts leading to the Civil War.

Example: Levi and Catherine Coffin, The Underground Railroad, religious groups, the abolition and anti-slavery groups, the Liberia colonization movement.

4.1.8 Summarize the participation of Indiana citizens in the Civil War.

Example: Indiana's volunteer soldiers, the Twenty-eighth Regiment of the United States Colored Troops, Camp Morton, John Hunt Morgan, The Battle of Corydon, Lew Wallace, resistance movements, and women on the home front.

Growth and Development: 1880 to 1920

4.1.9 Give examples of Indiana's increasing agricultural, industrial, and business development in the nineteenth century.

Example: Growth of railroads and urban centers, such as Indianapolis, South Bend, Evansville, Fort Wayne, and Gary; expansion of the educational system and universities; the growth of labor unions.

4.1.10 Describe the participation of Indiana citizens in World War I and the changes the war brought to the state.

1920 to the Present

4.1.11 Identify important events and movements that changed life in Indiana in the twentieth century.

Example: The Great Depression, World War II, African American migration from the South, post-war baby boom, civil rights movements, the Vietnam War, increase in Asian and Hispanic immigration.

4.1.12 Research Indiana's agricultural and industrial transformation, emphasizing new technologies, transportation and international connections, in the last part of the twentieth century.

Example: Use CD-ROM and Indiana history Web sites to research new farming technologies, development of the highway system, establishment of ports in Indiana, air travel, high-tech industries.

Chronological Thinking, Comprehension, Analysis, and Interpretation

4.1.13 Organize and interpret timelines that show relationships among people, events, and movements in the history of Indiana.

4.1.14 Distinguish fact from opinion and fact from fiction in historical documents and other information resources*.

Example: Identify different opinions on local and state events and issues from documents, cartoons, television, and other media.

* information resources: print media, including books, magazines, and newspapers; electronic media, such as radio, television, Web sites, and databases; and community resources, such as individuals and organizations

Research Capabilities

4.1.15 Using primary source* and secondary source* materials, generate a question, seek answers, and write brief comments about an event in Indiana history.

* primary source: developed by people who experienced the events being studied (i.e., autobiographies, diaries, letters, government documents)

* secondary source: developed by people who have researched events but did not experience them directly (i.e., articles, biographies, Internet resources, non-fiction books)

Standard 2

Civics and Government

Students will describe the components and characteristics of Indiana's constitutional form of government; explain citizenship rights and responsibilities; investigate civic and political issues and problems; use inquiry and communication skills to report findings in charts, graphs, written, and verbal forms; and demonstrate responsible citizenship by exercising civic virtues and participation skills.

Foundations of Government

4.2.1 Explain the major purposes of Indiana's Constitution as stated in the Preamble.

4.2.2 Describe major rights, such as freedom of speech and freedom of religion, that people have under Indiana's Bill of Rights (Article I of the Constitution).

Functions of Government

4.2.3 Identify and explain the major responsibilities of the legislative, executive, and judicial branches of state government as written in the Indiana Constitution.

4.2.4 Identify major state offices and the duties and powers associated with them, such as governor, lieutenant governor, chief justice, state senators, and state representatives and how they are chosen, such as by election or appointment.

Relationship of the United States and Other Nations

4.2.5 Explain that Indiana is one of fifty states in the United States and that other countries are also made up of smaller units, such as states, provinces, or territories.

Roles of Citizens

4.2.6 Give examples of how citizens can participate in their state government, and explain the right and responsibility of voting.

4.2.7 Define and provide examples of civic virtues* in a democracy.

Example: Individual responsibility, self-discipline/self-governance, civility, respect for the rights and dignity of all individuals, honesty, respect for the law, courage, compassion, reasoned patriotism, fairness, and commitment to the common good.

4.2.8 Use a variety of information resources* to research and write brief comments about a position or course of action on a public issue relating to Indiana's past or present.

* civic virtues: qualities that contribute to the healthy functioning of a democracy

* information resources: print media, including books, magazines, and newspapers; electronic media, such as radio, television, Web sites, and databases; and community resources, such as individuals and organizations

Standard 3

Geography

Students will explain how Earth/sun relationships influence the climate of Indiana; identify the components of Earth's physical systems; describe the major physical and cultural characteristics of Indiana; give examples of how the interaction of people with their environment has changed over time and continues to change; and identify regions of Indiana.

The World in Spatial Terms

4.3.1 Use latitude* and longitude* to locate places in Indiana and other parts of the world.

4.3.2 Estimate distances between two places on a map, using a scale of miles, and use cardinal* and intermediate* directions when referring to relative location.

4.3.3 Explain the essential facts of Earth/sun relationships* and be able to relate these to the climate of Indiana.

* latitude: imaginary lines that circle the globe from east to west; the equator is the line of latitude that divides the globe into two equal hemispheres

* longitude: imaginary lines that circle the globe from north to south and pass through the poles

* cardinal directions: north, south, east, and west

* intermediate directions: northeast, southeast, northwest, and southwest

* Earth/sun relationships: the rotation and tilt of Earth on its axis and the revolution of Earth around the sun influence climate variation on Earth; Indiana has major seasonal differences in climate relating to changes in the position of the sun and the amount of sunlight received

Places and Regions

4.3.4 Locate Indiana on a map of the United States; indicate the state capital, major cities, and rivers in Indiana and be able to place these on a blank map of the state.

4.3.5 Map the physical regions of Indiana, and identify major natural resources and crop regions.

Physical Systems

4.3.6 Explain how glacial periods shaped Indiana's landscape and environment.

4.3.7 Describe Earth's atmosphere*, lithosphere*, hydrosphere*, and biosphere*, and explain how these systems affect life in Indiana.

* atmosphere: the gases that surround Earth, including the air we breathe
* lithosphere: soil and rock that form Earth's surface
* hydrosphere: all the water on Earth's surface, including the hydrologic cycle (precipitation, evaporation, and condensation)
* biosphere: all plants and animals

Human Systems

4.3.8 Create a map tracing the routes and methods of travel used by settlers to reach Indiana, and identify ways in which settlers have changed the landscape in Indiana over the past two hundred years.

Environment and Society, Uses of Geography

4.3.9 Create maps of Indiana at different times in history showing regions and major physical and cultural features; give examples of how people in Indiana have modified their environment over time.

4.3.10 Read and interpret thematic maps, such as transportation, population, and products, to acquire information about Indiana in the present and the past.

Standard 4

Economics

Students will study and compare the characteristics of Indiana's changing economy in the past and present.

4.4.1 Give examples of the kinds of goods* and services* produced in Indiana in different historical periods.

4.4.2 Define productivity* and provide examples of how productivity has changed in Indiana during the past 100 years.

Example: Improved farm equipment has helped farms to produce more. Computers have helped businesses to produce more.

4.4.3 Explain why both parties benefit from voluntary trade*, and give examples of how people in Indiana engaged in trade in different time periods.

4.4.4 Explain that prices change as a result of changes in supply* and demand* for specific products.

4.4.5 Give examples of Indiana's role in world trade.

Example: Identify products made by Indiana companies that are exported and foreign-owned companies that are manufacturing products in Indiana.

4.4.6 List the functions of money* and compare and contrast things that have been used as money in the past in Indiana, the United States, and the world.

4.4.7 Identify entrepreneurs* who have influenced Indiana and the local community.

Example: Studebaker brothers, Madam C.J. Walker, Eli Lilly, and Marie Webster.

4.4.8 Define profit* and describe how profit is an incentive for entrepreneurs.

4.4.9 Identify important goods and services provided by state and local governments by giving examples of how state and local tax revenues are used.

4.4.10 Explain how money helps people to save, and develop a savings plan in order to make a future purchase.

* goods: objects, such as food or toys, that can satisfy people's wants
* services: actions that someone does for someone else, such as dental care or trash disposal
* productivity: amount of goods and services produced in a period of time divided by the productive resources used
* trade: voluntary exchange of goods or services
* supply: what producers are willing and able to sell at various prices
* demand: what consumers are willing and able to buy at various prices
* functions of money: helps people trade, measures the value of items, facilitates saving
* entrepreneur: a person who takes a risk to start a business
* profit: revenues from selling a good or service minus the costs of producing the good or service

Standard 5

Individuals, Society, and Culture

Students will examine the interaction between individual and group behavior in community life, analyze the roles and relationships of diverse groups of people contributing to Indiana's cultural heritage, and describe the impacts of science, technology, and the arts on Indiana's culture.

4.5.1 Identify ways that social groups* influence individual behavior and responsibilities.

Example: When people belong to a group they usually interact with each other frequently and follow the rules of the group.

4.5.2 Identify the different types of social groups to which people belong and the functions these groups perform.

Example: Social groups may have social, religious, recreational, cultural, educational, service, civic, political, or other functions.

4.5.3 Define the term cultural group*, and give examples of the challenges faced by diverse cultural groups in Indiana history.

Example: Quakers faced religious and social differences. Recent Asian and Hispanic immigrants face the challenge of adapting to a new language and culture.

4.5.4 Describe the role of Indiana artists in American visual arts, literature, music, dance, and theatre.

Example: James Whitcomb Riley, Gene Stratton-Porter, T.C. Steele, Janet Scudder, and the Hoosier Group.

4.5.5 Give examples of the impacts of science and technology* on the migration and settlement patterns of various groups.

Example: The invention of the steam engine changed the technology of travel and made it easier for immigrants to reach Indiana.

4.5.6 Investigate the contributions and challenges experienced by people from various cultural, racial, and religious groups in Indiana during different historical periods by reading biographies, historical accounts, stories, and electronic media, such as CD-ROMs and Web sites.

* social group: a group of people who share common goals and interests

* cultural group: a group of people who share common language, religion, and customs

* technology: the knowledge of how to make things, as well as the invention and development of tools, machines, and skills by humans

Questions?

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